

# **PRESENT AND FUTURE OF INDOOR AIR QUALITY**

Proceedings of the Brussels Conference,  
14-16 February 1989

*Editors:*

**C.J. Bieva, Y. Courtois and M. Govaerts**



1989

**EXCERPTA MEDICA, Amsterdam – New York – Oxford**

© 1989 Elsevier Science Publishers B.V. (Biomedical Division)

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise without the prior written permission of the publisher, Elsevier Science Publishers B.V., Biomedical Division, P.O. Box 1527, 1000 BM Amsterdam, The Netherlands.

No responsibility is assumed by the Publisher for any injury and/or damage to persons or property as a matter of products liability, negligence or otherwise, or from any use or operation of any methods, products, instructions or ideas contained in the material herein. Because of rapid advances in the medical sciences, the Publisher recommends that independent verification of diagnoses and drug dosages should be made.

Special regulations for readers in the USA - This publication has been registered with the Copyright Clearance Center Inc. (CCC), 27 Congress Street, Salem, MA 01970, USA. Information can be obtained from the CCC about conditions under which photocopies of parts of this publication may be made in the USA. All other copyright questions, including photocopying outside the USA, should be referred to the copyright owner, Elsevier Science Publishers B.V., unless otherwise specified.

International Congress Series No. 860  
ISBN 0 444 81134 6

*This book is printed on acid-free paper.*

*Published by:*  
Elsevier Science Publishers B.V.  
(Biomedical Division)  
P.O. Box 211  
1000 AE Amsterdam  
The Netherlands

*Sole distributors for the USA and Canada:*  
Elsevier Science Publishing Company Inc.  
655 Avenue of the Americas  
New York, NY 10010  
USA

Printed in The Netherlands

2024722203

## FOREWORD

Indoor air quality conservation and procedures for the measurement of related potential pollutants, such as radon, asbestos, gases, pesticides, tobacco smoke and bacteria from air conditioning systems, have seen important changes in recent years, while the range and the scope of the studies have continued to expand.

In addition to helping preserve public health, the field of interest is now extending to include such areas as architectural design, ventilation engineering, sociology, psychology and legal aspects. Related analytical techniques like gas chromatography and mass spectroscopy have undergone parallel refinements and their range of application has broadened.

These advances were discussed at the Conference 'Present and Future of Indoor Air Quality', held in Brussels, February, 1989, following symposia on indoor air quality at Essen and Tokyo in 1987 and London in 1988. The sessions were attended by about 200 scientists representing 20 countries. A total of 92 papers and posters were presented covering such topics as pathogenesis and epidemiology, sources of indoor air contamination and risk assessment, chemistry of indoor air related to the outdoor air quality, social and psychological aspects of poor indoor air quality, motivation and attitudes, future guidelines for the improvement of indoor air quality through architectural and ventilation design, and air quality monitoring.

The proceedings include full texts and posters presented during the meeting. The organising committee hopes that they will constitute a useful guide for the improvement of our indoor air quality in the future.

2024722204

# CONTENTS

## OPENING SESSION: RISK ASSESSMENT AND HEALTH

Cancer control and lifestyle medicine <i>E.L. Wynder</i>	3
Sick building syndrome - Clinical aspects and prevention <i>C. Molina</i>	15
The ambient air, perceptions and tolerance thresholds: Changing social standards <i>N. Delruelle</i>	23
Concerns and risks of home pollution assessed from the 329 cases reported to a Poison Control Centre during 1987 <i>G. Riboulet-Delmas, R. Garnier and M.-L. Efthymiou</i>	29
Carbon monoxide poisoning: Epidemiology and prevention <i>B. Tissot, M. Govaerts and N. Tinant</i>	37
Current state of research on air quality inside buildings <i>J.C. Loewenstein</i>	43
Radon and lung cancer: A case-control study in southern Belgium <i>A. Poffijn, R. Mak, P. Weynants, M. Vanhoorne and J. Prignot</i>	51
Indoor radon in Belgium <i>A. Poffijn and H. Vanmarcke</i>	55

## SECTION 1: ETS AND PASSIVE SMOKING

Environmental tobacco smoke and lung cancer: Is it the smoke or the diet? <i>L.C. Koo</i>	65
Dietary habits are of limited importance in influencing the lung cancer risk among Japanese females who never smoked <i>T. Hirayama</i>	77
An example of extra-poisson variation suggesting an under-specified model <i>S.J. Kilpatrick</i>	83
Lung cancer risk by oral exposure <i>R. Rylander, H.-J. Haussmann and F.J. Tewes</i>	91
Passive smoking: Acute effects on lung function of sensitive persons <i>B. Danuser, A. Weber and A.L. Hartmann</i>	101
Evaluation of exposure to ambient tobacco smoke: A few concrete examples concerning the value of biological and atmospheric indicators <i>A.M. Laurent, Y.A. Courtois, S. Preter, J.R. Claude and B. Festy</i>	103

2024722205

Exposure to environmental tobacco smoke in the non industrial workplace under different conditions of ventilation and smoking regulation	
<i>T. Sterling, C. Collett and J. Ross</i>	111
Passive smoking and lung cancer; fact or fiction?	
<i>P. Lee</i>	119
Initiatives taken within parents in school to reduce passive smoking risks	
<i>C. Arciti, B. Doglio and L. Santi</i>	129
Health care and society: Environmental tobacco smoke and lung cancer	
<i>E.L. Wynder and G.C. Kabat</i>	135
Isoprene - A potential indoor indicator for environmental tobacco smoke	
<i>G. Löfroth</i>	147
The passive smoking myth	
<i>N. Mantel</i>	155
Relative lung cancer risk from exposure to mainstream and sidestream smoke particulates	
<i>J.J. McAughey, J.N. Pritchard and A. Black</i>	161
Measurement of environmental tobacco smoke in an air-conditioned office building	
<i>C.J. Proctor, N.D. Warren and M.A.J. Bevan</i>	169
Nicotine and indoor air pollution	
<i>C. Arfi, J. Kaloustian, A.M. Pauli, J. Pastor, F. Grimaldi, F. Gouezo and A. Viala</i>	173
Assessing the validity of a Japanese cohort study	
<i>M.W. Layard and J.R. Viren</i>	177

## SECTION 2: INDOOR AIR QUALITY: CHEMISTRY AND BIOLOGICAL EFFECTS

Exposure to ETS and its biological effects: A review	
<i>F.X. Adlkofer, G. Scherer, L. Von Meyerinck, Ch. Von Maltzan and L. Jarczyk</i>	189
Carbonyl compounds in mainstream and sidestream cigarette smoke	
<i>H. Schlitt and H. Knöppel</i>	197
Sensory responses to environmental tobacco smoke from cigarettes that heat but do not burn tobacco	
<i>J.C. Walker, R.A. Jennings, W.T. Morgan, J.H. Robinson, D.W. Griffith and J.H. Reynolds IV</i>	207
Role of combustion products in bronchial hyperreactivity - A case control study	
<i>M. Bert, J. Kühr, A. Hendel-Kramer, T. Urbanek, E. Schultz, H. Steiger and W. Karmaus</i>	215
The importance of endotoxin and glucan for symptoms in sick buildings	
<i>R. Rylander, S. Sörensen, H. Goto, K. Yuasa and S. Tanaka</i>	219

An epidemiological study on dose-response relationship between B(a)P concentrations in indoor air and lung cancer mortality in Xuan Wei, China <i>He Xingzhou, Chen Wei and Chen Hong</i>	227
Health consequences of atopy, food intolerance and indoor environment: A case study <i>E. Sammaljärvi</i>	235
Assessment of exposure to emissions from a liquefied petroleum gas stove used in urban India <i>V. Haraprasad and J.M. Dave</i>	239
Quality of indoor environment in dwellings according to performance of heating system <i>D. Petráš</i>	243
Oxides of nitrogen and respiratory illness. Is there a susceptible population? <i>J.M. Sneddon and T.M. Bearpark</i>	247
The effect of indoor air pollution on health from coal burning containing high fluorides <i>Ji Rongdi and Cao Shouren</i>	253
Effect of reservoir fuel levels on emissions from a kerosene cook stove <i>J.M. Dave and V. Haraprasad</i>	257
Study of the small-scale relations between indoor and outdoor pollution (SO <sub>2</sub> - NO <sub>x</sub> - particles) in a hospital in the Paris region <i>J.C. Loewenstein</i>	261
Nicotine absorption in humans following exposure to environmental tobacco smoke generated from different types of cigarettes <i>J.D. deBethizy, L.E. Bates, R.A. Davis, D.L. Heavner, P.R. Nelson, J.C. Walker and J.H. Robinson</i>	269
Characterization of the environmental tobacco smoke generated by different cigarettes <i>P.R. Nelson, D.L. Heavner and B.B. Collie</i>	277
Health and social problems of carbon monoxide poisoning from the usage of anthracite coal in Korea <i>Yong Chung, Dongchun Shin and Youngwook Lim</i>	283
On the use of environmental tobacco smoke component ratios <i>G.B. Oldaker III, W.E. Crouse and R.M. Depinto</i>	287

### SECTION 3: INDOOR AIR QUALITY: VENTILATION, CLIMATISATION AND POLLUTANTS

Ventilation, health and energy conservation - A workable compromise <i>G. Robertson</i>	293
Ventilation system retrofits as a method of solution for the 'sick building syndrome' <i>C. Collett and E. Sterling</i>	301

2024722207

A few studies of air-conditioned environments <i>A. Mouilleseaux, F. Squinazi and B. Festy</i>	309
Regression model for indoor concentrations of combustion-generated gases <i>A. Hendel-Kramer, J. Kühr, R. Urbanek, H. Staiger, E. Schultz and E. Karmaus</i>	315
A Czechoslovak survey about ventilation habits in dwellings <i>L. Piršel</i>	321
Emissions from materials; The role of additives in PVC <i>K. Saarela, K. Kaustia and A. Kiviranta</i>	329
Influence of indoor air pollution on NO <sub>2</sub> personal exposure levels of schoolchildren <i>Y. Shimizu, S. Imai and Y. Tsunetoshi</i>	337
Indoor pollution by mineral fibers <i>J. Bignon, G. Dufour, M.A. Billon-Galand, A. Gaudichet, H. de Cremoux and P. Brochard</i>	347
The Acarex/Acarosan concept, its possibilities in allergology and dermatology <i>J.E.M.H. Van Bronswijk, G. Schober and F.M. Kniest</i>	355
Elimination of house dust mite excreta, the carriers of allergens in the indoor air <i>E. Bischoff, A. Fischer and B. Liebenberg</i>	363
Portable air sampler for measurements in aircraft and public buildings <i>J.F. van der Wal</i>	371
Destruction of acarids and biodecontamination of domestic environment <i>M. Blanc and Ch. Boutin</i>	379
Dust in the work environment: Effect of pharmacological agents on the airway response to inhaled cotton dust <i>P.J. Nicholls, M. McDermott, M. Bevan and D. Griffiths-Johnson</i>	385
Moulds, mites and moisture: A preliminary report on six cases of fungal damage in dwellings <i>H.S.M. Kort, J.E.M.H. Van Bronswijk and G. Schober</i>	389
Absolute indoor air humidity and the abundance of allergen producing house dust mites and fungi in the Netherlands <i>G. Schober</i>	395
Air quality control of public car parks <i>F. Cupelin and J.Cl. Landry</i>	401

#### SECTION 4: INDOOR AIR QUALITY: PREVENTION AND FUTURE GUIDELINES

Demand controlled ventilating systems: New concepts for indoor air quality and energy conservation <i>L. Trepte</i>	407
A database of problem buildings: Learning by past mistakes <i>C.W. Collett, E.M. Sterling, T.D. Sterling and J.J. Weinkam</i>	413

2024722208

Treatment programme for microbiologically contaminated airconditioning installations <i>E. Clement and R. De Koster</i>	421
Present and future exceedance of health related reference values for air pollutants in Dutch dwellings <i>H.J. Van de Wiel and E. Lebre</i>	427
French incentive actions for research on indoor air quality in buildings <i>J.-P. Marie, J. Dubois and P.-C. Jacquignon</i>	435
A nitrogen oxide analyser designed for the study of indoor pollution: The APPI-AC35 <i>B. Millancourt</i>	443
Automatic analyser prototype for atmospheric isoprene and monoterpenes <i>M.L. Riba, B. Clement, M. Haziza and L. Torres</i>	449
Air tightness, permeability or transparency to air in buildings, different names for one same problem <i>M. Kilberger</i>	453
Index of authors	461

2024722209